

ORRES. CONTROL
TGOING LTR. NO.
ORDER #

5-RF-07272

DIST.	LTR	ENC
SUSSEN, S.		
L. T.		
D. R. G.		
II, V.		
RTINEZ, L.		
JAY, B.		
RIEN, G.		
OR, N.		
PHES, G.		
IER, C.		
HAHL, T. G.	X	X
J. A.		
ELTON, D. C.		
ALEY, D. L.		

D. R. H.		
AMORE, J. A.		
RR, K. A.		
IN, S. J.		
NEDY, C. E.		
ODD, R. G.		
TER, G. L.		
BEN, A. K.	X	X
INAUER, A. T.		
EMELT, K. L.		

RES. CTRL.	X	X
FFIC		
MIN. REC.		
S		

CLASSIFICATION:		
CLASSIFIED	X	X
CONFIDENTIAL		
SECRET		

AUTHORIZED CLASSIFIER
SIGNATURE

Class. Rev. Waiver
- Class. Office

9-19-95

REPLY TO RF CC NO:

None

ION ITEM STATUS

PARTIAL/OPEN
CLOSED

APPROVALS:

ORIG & TYPIST INITIALS

AKS :kam
46459 (REV. 7/85)

DOCUMENT CLASSIFICATION
REVIEW WAIVER PER
CLASSIFICATION OFFICE



KAISER-HILL
COMPANY

September 19, 1995

95-RF-07272

Jessie M. Roberson, Assistant Manager
Environmental Restoration
DOE, RFFO

TRANSMITTAL OF THE RESPONSE TO COMMENTS FOR THE OPERABLE UNIT (OU) 2
DRAFT FINAL PHASE II RFI/RI REPORT - TGH-266-95

Action: Request transmittal of Response to Comments

Enclosed are the complete Environmental Protection Agency (EPA) and the Colorado Department of Public Health and Environment (CDPHE) comments on the OU 2 Draft Final Phase II RCRA (Resource Conservation and Recovery Act) Facility Investigation/Remedial Investigation (RFI/RI) Report and the proposed responses to these comments. The Draft Final OU 2 Phase II RFI/RI report was delivered on May 23, 1995. As almost all of the report had been previously reviewed by the Agencies, minimal comments were expected. However, 24 pages of comments were received from the EPA on August 3, 1995 and the 75 comments were received from CDPHE on August 24, 1995, about one month behind schedule. We have requested a one month extension of the Interagency Agreement milestone from September 21, 1995 to October 23, 1995, in order to incorporate these late comments and comment responses into the final document.

There were substantially more comments received than anticipated. As we have previously discussed, these comments are minimally addressed as necessary. Errors will be corrected and confusing passages will be clarified. However, where the comment would require substantial effort to fully address and incorporate, yet yield little if any changes in the report's conclusions, the comment response reflects that the RFI/RI report will not be changed.

Numerous comments were received from both the EPA and CDPHE on the risk assessment, modeling and data set used in the report. The OU 2 risk assessment was generated after detailing the work to be completed in four, required, risk assessment technical memoranda and one letter report. These technical memoranda detailed the data and the methodology to be used for the chemical of concern (COC) identification, modeling, exposure scenarios, toxicity assessment and the CDPHE screen letter report. These were all reviewed and approved by the Agencies prior to completion of the activity. The data set was proposed in the COC technical memo and approved by EPA and CDPHE.

The groundwater and surface water models proposed in the modeling TM were approved by EPA and CDPHE. Numerous presentations were made during the modeling process to keep everyone informed of the numerous small changes that are always necessary. The modeling efforts were designed to generate the most conservative risk numbers. Using these very simplistic and very conservative models, no elevated risk from OU 2 was shown. The more realistic models requested are less conservative and will yield even less risk. Therefore, this approach is not recommended. The data set used in the report was previously approved in the COC process. While this data set ends two years ago, this large amount of data is still representative of OU 2 conditions. More recent groundwater and surface water data are presented in the annual groundwater and surface water monitoring reports. Recent trench data were not collected for and do not meet the data quality objectives for the RFI/RI reports. These data will be presented in a separate report. The recent storm event data were not collected for the RFI/RI report and also do not meet the data quality objectives for the report. The RFI/RI reports are designed to demonstrate normal to somewhat conservative conditions. The recent

Kaiser-Hill Company, L.L.C.

Courier Address: Rocky Flats Environmental Technology Site, State Hwy. 93 and Cactus, Rocky Flats, CO 80007 • 303.966.7000
Mailing Address: P.O. Box 464, Golden, Colorado 80402-0464

A-OU02-001222

Jessie M. Roberson
September 19, 1995
95-RF-07272
Page 2

storm event clearly did not fall into this category. These results will also be presented separately.

Many of the risk assessment comments dealt with the process of how the risk assessment was put together, without regard to whether or not the comment would impact the results of the risk assessment. Many of these comments had been previously addressed in meetings or in the technical memorandum comment responses. Each comment has been dispositioned as appropriate in the comment response. However, comments that would not change the results of the risk assessment were not incorporated into the risk assessment.

The comment that the bedrock was sufficiently characterized represents a major accomplishment. A Notice of Violation was issued for the Draft Phase II RFI/RI Report because the bedrock had not been characterized. After an expedited, abbreviated field program was conducted, which relied heavily on the observational approach, the conclusion was reached that there is no pathway through the bedrock. This comment implies that this conclusion has been accepted.

If you have any questions or require further information, please call Ann Sieben, of my staff, at extension 9886.



T. G. Hedahl, Director
ER/W&I Operations

AKS:kam

Orig. and 1 cc - J. M. Roberson

Enclosures:
As Stated (3)

cc:

J. E. Law - RMRS
J. L. McNally - "
A. L. Primrose - "
A. M. Parker - "
R. K. Volk - "
RMRS Records
ER Project File (2)

Colorado Department of Public Health and Environment
Hazardous Materials and Waste Management Division

Comments on

DRAFT PHASE II RFI/RI REPORT FOR OPERABLE UNIT 2
May 1995

GENERAL COMMENTS:

1. The Division is concerned that some available data was not included in this report:
 - monitoring well data since the 4th quarter of 1992;
 - recent trench characterization data, including information describing and characterizing Trench T-13;
 - data from the CDPHE-Radiation Control Division's air sampling network for comparison with the RAAMP samplers;
 - 1992 and 1993 Environmental Reports for air monitoring data; page 2-37 references the 1991 Environmental Report;
 - data from the Spring of 1995 precipitation event.

It is understood that a data cutoff had to be established and that it would have been difficult to incorporate the more recent of these data into the report. However, much of the missing data may directly influence the results of the report. For instance, the recent trench characterization data has altered the list of contaminants and even the location of certain trenches.

Available data that is missing from the report should be incorporated into OU-2's Administrative record and compiled as an addendum to the report. Any significant differences between these data and the RFI/RI Report should be highlighted and discussed. The report must be able to serve as the informational basis for realistic future decisions.

Data collected during the OU2 Trenches Area and Mound Site Characterization will be compiled into a Characterization Report to support source removal actions at Rocky Flats. This report will be made available to the agencies upon its completion. Additional data collected after fourth quarter 1992 and the spring 1995 precipitation events will be documented in the annual Surface Water, Ground Water Monitoring and Environmental reports which are submitted to the agencies as mandated in the iAG.

2. The text indicates that seeps exist east of the surface water drainage gully and also east of the East Spray Fields (page 3-57). Because the groundwater in this area has been less impacted by site contaminants, the scope of work established for this report did not include an investigation of the area. This eastern area may not, therefore, be characterized sufficiently to understand whether a groundwater pathway exists across this area.

Seeps exist along the south flank of South Walnut Creek in the area east of the surface drainage gully. However, as evidenced by the contaminant plume maps illustrated in Figures 4.4-3 through 4.4-45, groundwater contaminant plumes have not migrated to this area. Occasional, sporadic detections at low concentrations (less than 10 ppb) have been noted (Plates 4.4-1 and 4.4-2) in the area east of IHSSs, but nothing that would denote a contaminant plume. Groundwater solute transport modeling results further confirm that the existing groundwater contaminant plumes have already approximately reached steady state conditions, and minimal further migration would be expected.

Therefore, additional characterization of the East of IHSSs area beyond that already performed is not warranted.

3. The risk assessment portion of this report tries to minimize risk, rather than simply presenting the risks and uncertainties from current contaminant levels in the baseline risk assessment using the agreed-upon exposure factors. In addition, the report tries to stretch the 10^{-4} - 10^{-6} risk range, especially when determining the point of departure. An RFI/RI Report is supposed to present the results of field activities, characterize sources of contamination, and define the nature and extent of contamination and the fate and transport of contaminants. It is inappropriate for an RFI/RI Report to draw conclusions and make recommendations for future actions.

Although the Human Health Risk Assessment shows OU 2 does not pose a significant risk to public health, the text of Section 7.0, Conclusions and Recommendations of the RFI/RI Report shall be revised to summarize the findings of the report and not to make decisions on remedies for OU 2. Comments regarding additional investigations and remedies shall be deleted from the text.

4. The document consistently looks at point of compliance as being at Indiana Street. With respect to surface water, compliance points should be prior to entering Ponds C2 or B5, which have been classified as waters of the state and U.S. With respect to groundwater, it would seem that the extent of a plume would be taken into account in setting the point of compliance, rather than a property boundary.

The Phase II RFI/RI Report did not attempt to establish a point of compliance for OU-2. The receptor locations for the Human Health Risk Assessment were established based on the applicable scenarios. Indiana Street was selected as the point of surface water investigations for the purpose of maximizing concentrations, loadings, and flows that leave OU2. This procedure is consistent with the scope of the RFI/RI. Compliance issues are addressed in other programs such as the Rocky Flats NPDES permit.

5. The Executive Summary (page ES-40) and Section 7.2 (page 7-5) state that "The results of the HHRA support the conclusions that environmental contamination within OU-2 does not pose a threat to public health under the evaluated exposure scenarios, and that remediation of environmental media to address public health risk issues is not warranted." Although PPRGs may be the target for the RFI/RI process, accelerated actions performed at OU-2 need to be done in a way that is consistent with the final remedy. And the final remedy will include meeting ARARs, which will include stream and groundwater standards that could be much more restrictive than a human health-based standard on which this document relies.

The comment in the Executive Summary shall be deleted. Accelerated source removal actions shall be presented to the Regulatory Agencies, in the form of Proposed Action Memorandums (PAMs), Interim Measure/Interim Remedial Action (IM/IRA), or Engineering Evaluation/Cost Analysis (EE/CA) for approval prior to remediation. Any proposed actions will be consistent with final remedies and will work towards meeting the established ARARs.

6. The last paragraphs of both the Executive Summary (Page ES-42) and of Section 7.0 (Page 7-7) recommend assessing the capabilities and limitations of available detection technologies for plutonium and americium before proceeding with localized remediation. This report is supposed to have characterized the nature and extent of contamination at OU-2, providing sufficient data to support future remedial actions.

These will be revised. The nature and extent of contamination at OU 2 have been characterized, additional data collected during the OU2 Trenches Area and Mound Site

Characterization will allow volume estimates for remediation to be calculated and support the health and safety of remediation workers.

SPECIFIC COMMENTS:

7. Section ES5.0, Page ES-31

This section of the executive summary states that "organic, radionuclide and metal COCs in surface soil appear to have relatively low mobility" and "the potential for offsite migration is low." This statement does not appear to be true with respect to the May 1995 precipitation event when surface water radionuclide concentrations were observed at some of the highest levels on record. This is especially true in the area of the SID and C2. Although the ponds served to detain the stormwater for a short time, detention times in the ponds were inadequate and the surface water, containing elevated radionuclide concentrations left the site.

The potential for offsite migration does appear to be low even with the above average conditions seen in the May precipitation event. Results of discharge samples collected from the terminal ponds during the May 17, 1995 precipitation event indicate: concentrations of Pu239/240 for Pond A-4 and C-2 discharges slightly above the CWQCC surface water plutonium chronic standard of 0.05 pCi/l; and Am241 concentrations for Pond B-5 discharges slightly above the CWQCC surface water chronic americium standard of 0.05 pCi/l. The May 17, 1995 results for Pu and Am represent an acute event and, for Ponds A-4 and B-5, do not indicate an exceedence of the chronic standard based on a 30 day moving average of sample results. During May 1995, the average result for releases from Pond C-2 was approximately 0.1 pCi/l, slightly above the site standard but well below the state-wide standard of 15 pCi/l. As the site-wide standards are extremely low, and the May 17, 1995 storm has been roughly estimated to have generated 100 year flows (~100 year event based on flow, ~20 year event based on precipitations), the radionuclide mobility is still considered to be relatively low.

The areas of the SID and Pond C-2 may show elevated radionuclide values during the May 17, 1995 event. However, the statement in question takes into consideration the trapping efficiency of the ponds and refers to transport of contaminants off site.

8. Section 2.3.1, Page 2-37

The statement that TSP and PM₁₀ are included in the nonradiological monitoring is misleading. TSP and PM₁₀ are the only nonradiological monitoring done.

The text will be modified to say nonradiological monitoring consisted of TSP and PM₁₀.

9. Section 2.3.1.2 Page 2-38

The reference to the Clean Air Act Amendments of 1977 should be updated to the 1990 amendments.

The text will be modified to reference the Clean Air Act Amendments of 1990.

10. Section ES4.1.4, Page ES4-13 Explain how BSLs for Pu and Am that are applicable to the LHSU were derived.

It is not clear to what "background screening levels" the reviewer is commenting. In addition, it is unclear if the reviewer is referring to LHSU geologic materials or LHSU groundwater. Further clarification is needed in order to respond to this comment. There will be a meeting arranged to discuss this comment.

11. Section 3.5, Page 3-9; Section 3.5.2, Page 3-32

This section refers the reader to the 1991 *Geologic Characterization Report*, but should have referenced the *Geological Characterization Report for the RFETS* (March 1995).

The March 1995, Geological Characterization Report for the RF-ETS was not available at the time that the geologic interpretation of OU2 for this RFI/RI was conducted. However, the text will be expanded to acknowledge the March 1995 Characterization Report as well as the 1991 report used.

12. Section 4.1.1.5, Page 4-9

This section states that, "all available surface soil data were used..." Does this include the soil data from CDPHE's Radiation Control Division studies?

The CDPHE's Radiation Division's data were not within the data extracted. All surface soil data within OU2 that were in the RFEDS as of February 1994, which was the date of data extraction for the preparation of this RFI/RI report, were used. See Section 4.1.1.1 for the surface soil data used.

13. Section 4.4.2.2, Page 4-159

In the discussion of unfiltered metals and TSS, it would be helpful to compare these concentrations over time for this well in addition to the comparison with average values.

A comparison of unfiltered metals and TSS will not enhance the discussion. The text presented in Section 4.4.2.2 pertained specifically to two sampling events (March 18, 1992 and July 30, 1992), which exhibited very high TSS concentrations (11,000 mg/L and 24,000 mg/L, respectively). Sixteen of the 20 metals detected at concentrations above the BSLs had their maximum concentrations associated with one of these sampling events. The high TSS concentrations suggest turbid conditions in the samples collected on these dates, which could affect the analytical results for the unfiltered samples. The observation was made; however, the data were used as reported.

14. Section 4.4.2.5, Page 4-166

In the discussion of filtered metals, the last sentence of the third paragraph belongs at the end of the next paragraph; the last sentence of the fourth paragraph likewise belongs at the end of the fifth paragraph.

The text will be revised accordingly.

15. Section 4.2.4.1, Page 4-40

The text states that none of the surface soil in the upper Walnut Creek drainage shows plutonium contamination in excess of 0.9 pCi/g. Does this area include the A-series and B-series ponds and the area along Walnut Creek to Indiana Street? If so, then measurements taken by CDPHE's Radiation Control Division as well as Figure 4.2-2 refute this statement.

Pond sediment data was not included in the surficial soil analysis. The data used were collected for this study, and collected in a specific manner for comparability. Figure 4.2-2 shows the Pu-239/240 results (denoted as activity concentrations in pCi/g within acre or quarter acre sampling plots) for samples collected for this study. The contours represent kriged lines of equal activity concentration. The 1.0 pCi/g line crosses the South Walnut Creek drainage; however, the highest activity concentration is 0.64 pCi/g for samples collected in the drainage.

16. Tables 4.3-21, 4.4-2, 4.4-3, 4.4-7, 4.5-1

Clarify whether the nitrate values in these tables are reported as nitrogen or nitrate by the lab.

The lab reported nitrate/nitrite values as a measure of nitrogen as specified in the GRRASP.

17. Table 4.7-1 Concentrations listed as µg/l should be µg/ml.

Units will be corrected for the final report.

18. Section 5.3.2, Page 5-37

The third paragraph in this discussion notes that there is no well screened in the No. 1 Sandstone downgradient of Trench T-3. An additional monitoring well may therefore be needed north of Trench T-3 as part of future remedial action. Also, there is inadequate well coverage to assume all alluvial groundwater is discharged by the Surface Drainage Gully.

The text in the 2nd paragraph on Page 5-37 reads, "It should be noted that no wells were installed north of Trench T-3 in the Arapahoe Formation No. 1 Sandstone as part of the OU2 investigation." The sentence will be revised to "... no wells were installed immediately north of Trench T-3 ...". There are 3 monitoring wells north of Trench T-3 in No. 1 Sandstone. The three wells are Wells 11891, 03391, and 0391, as shown in Figure 4.4-24.

The RFI/RI does not conclude that all alluvial groundwater discharges to the surface drainage gully. However, the medial paleosol appears to be a pathway for the migration of contaminated alluvial groundwater as evidenced by the contaminant plume maps (Figure 4.4-3 through 4.4-45). Based on the analytical results from alluvial groundwater samples collected in the vicinity of the gully, discharge of contaminants at the surface drainage gully appears to be minimal. This observation will be expanded to include that the migration of contaminants eastward is minimal based on groundwater concentrations in the eastern portion of OU2 that are at or below the method detection limits.

19. Section 6.2.1, Page 6-5

DOE states that, "seep surface water and sediment samples were used as a reasonableness check on the results of the groundwater modeling to predict contaminant concentrations at the seeps but were not otherwise used in risk assessment because human receptors were not exposed at the seeps." If the seeps are not institutionally controlled in some way to limit access, open space receptors in particular may become exposed to them. Exposure should be assessed at every point a receptor could reasonably come into contact with one of the major contaminated media. The assessment of exposure somewhere downstream from these seeps potentially dilutes out the exposure to groundwater contaminants that come to the surface at the seeps, thereby underestimating risk.

Human health risk assessment is based on long term chronic exposures to environmental media. Therefore, exposure scenarios that contact surface water are assumed to contact this water at Woman and Walnut Creek. The OU2 Exposure Scenarios Technical Memorandum (5) presented the exposure pathways and receptors that were utilized in this RFI/RI Report.

20. Section 6.2.2, Page 6-5

Because of the complicated and variable way in which DOE treated detection limits for different chemicals, as described in Section J6.3.2, page J-22, clarity would be greatly improved if a column were added to the data tables (e.g., those in Appendix J2) explicitly saying the actual detection limit and type of detection limit (IDL, MDL, etc.) that was used for each chemical assay included in the assessment. This would simply involve taking information such as that listed in Table J6.3-1 and incorporating it as a column labelled "Type of DL". This information would help the reviewer judge more easily whether proper detection limits were used, whether detection limits were elevated during particular assays, whether matrix interference could be playing a role, the closeness of an assay to the detection limits, etc. The agency reviewers need this information to be readily available in order to be able to judge the amount of uncertainty in the measurements. EPA's "Guidance for Data Useability in Risk Assessment (Part A) Final" clearly states on p. 47

that, "the RPM should consult with the project chemist and the risk assessor whenever analytical methods are to be selected, and specify the nature of the detection limits that must be reported; if no requirement has been specified, then the laboratory should be requested to explicitly describe the types of the detection limits it reports." Since DOE already has this information, it should not be difficult to provide it to the agencies in a clear manner.

Appendix J and C tables provide the analytical test code for each analyte under the header "METHOD." The user is referred to the GRRASP guidance for the nominal detection limit associated with the test code. Appendix J and C tables also provide the "result" the "detection limit", and the "lab qualifier."

21. Section 6.3.1. Page 6-10: Section H3.1.6. Page H3-3

What is the rationale for using RBCs calculated for construction workers rather than for residential exposure to assess contamination in subsurface soil? Typical excavations done for residential construction would potentially expose residents to subsurface soil. **Not** assessing risk of residential exposure to subsurface soil will leave a gap in the risk assessment continuum. At the end of Section 7.1 on page 7-3 the report says that average and RME conditions are evaluated in the risk assessment, "so that risk management decisions **can** be based on a range of potential risk for different exposure scenarios."

Construction worker PRGs were used to assess subsurface soils in the Chemical of Concern (COC) selection process. This is consistent with the human health risk assessment within the RFI/RI Report where risks from contaminants in subsurface soils are assessed through the construction worker scenario. In order to address CDPHE's concern though, PRGs for the residential exposure scenario were used in the CDPHE conservative screen to assess subsurface soils down to 12 feet. The human health risk assessment within the RFI/RI Report was developed on a separate basis than the CDPHE conservative screen.

22. Section 6.5.1. Page 6-17

This section, which discusses the way samples are treated which had to be diluted because of high analytical results, is unclear. The text states that, "the SQL for diluted samples can far exceed the measured concentrations of the chemical in other samples. These samples were excluded from the data set if they caused the arithmetic mean concentration to exceed the maximum detected concentration." It is assumed that the reason for dilution in this discussion is to bring high concentrations of a particular analyte within the range of a certain analytical methods. Are there other reasons sample dilution was utilized? It appears that this procedure may allow high analytical results, that are otherwise valid, to be ignored.

Dilution is usually required when concentrations of one or more analytes exceed the linear working range of the instrument. However results from the analyte(s) that necessitated the dilution were reported and used in the data evaluation.

The referenced discussion pertains to samples results that were "u-qualified" (nondetect) with an SQL elevated probably due to sample dilution. To use one-half of the elevated SQL for these nondetected results would erroneously increase the estimate of the concentration term (EPA 1989a RAGS). One of the reasons for dilution is to bring high concentrations of a particular analyte within the range of a certain analytical method as mentioned. However, the analytes exhibiting the high concentrations would not be "u-qualified."

We will modify the text to include a reference to EPA 1989a RAGS where elimination of unusually high SQLs for nondetected results is discussed.

23. Section 6.5.7. Page 6-21

What was the rationale for not using the same RME source concentrations when modeling soil

gas in the 10- and 30-acre areas as were used over the whole AOCs 1 & 2? The rationale for calculating exposures in the 10- and 30-acre subareas of the AOC 1 was to obtain an average exposure of receptors to these areas. The maximum concentrations used are appropriate for a screen, but do not give an average exposure appropriate for assessing longer term contact in those smaller subareas such as is done in a baseline risk assessment.

The human health risk assessment for the 10 acre area and 30 acre area in AOC #1 show a carcinogenic risk of 1.1×10^{-9} and 5.9×10^{-10} for the "Inhalation of VOCs from Infiltration of Soil Gas" pathway (See Table H8-2). Even though the maximum VOC concentrations were used to assess the VOC inhalation pathway, the risks due to this pathway are about 6 orders of magnitude less than the risks for all pathways combined. This difference in risks does not warrant the recalculation of VOC inhalation risks using average concentrations.

24. Section 6.5.8. Page 6-22 (Also Appendix H. Section H5.6.2. Page H5-9 and Table H5-10)
Why is the generic Andelman volatilization constant (VF) used to convert water concentrations (mg/L) to air concentrations (mg/m³) rather than deriving chemical-specific volatilization constants based on the equation in Dinan, 1992, "Changes to Equations in the Part B Guidance". A rationale is needed to explain why Andelman's VF is more appropriate than chemical-specific VFs would be.

The Andelman reference cited here does not contain the 0.065 mg/m³ Andelman VF constant that was used to obtain RME air concentrations. Please provide the actual calculations, the correct reference, and a copy of the "simple model" referred to on page H5-9, which was used to calculate RME indoor air concentrations resulting from the domestic use of groundwater.

The pathway used to assess risks in this section is the "Inhalation of indoor VOCs due to domestic use of ground water." The risks from this pathway are derived from the inhalation of VOC vapors emanating from showers, toilets, wash water, etc.. The equations in Dinan, 1992 apply to the emanation of VOCs from soils only and were therefore not used.

The volatilization factor is outlined on page 500 of the Andelman reference.

25. Section 6.5.11. Page 6-24

It is not intuitively obvious in the text how DOE obtained the estimated fraction of vegetables (0.3), and of fruit (0.7) which would be affected by deposition of PM₁₀. Reference should be made to Table H5-13 in the text.

Section 6.0, summarizes the risk assessment, whereas the complete risk assessment is presented in Appendix H. The details related to estimation of fraction of ingested homegrown produce with edible surface that would be affected by deposition PM₁₀ are presented in Appendix H, Section H5.8.2 and Table H5-13. The text in Section 6.5.11 contains a reference to Table H5-13.

26. Section 6.5.12. Page 6-25 (Also Table 6.5-12)

What is the rationale for using an average accumulation time of 15 years instead of the RME residential exposure duration of 30 years? Also explain the rationale for the 0.5 averaging factor applied to the chemicals listed in Table 6.5-12. Neither of these averaging factors were included in any previous discussions with the agencies on acceptable factors.

The 0.5 averaging factor in Table 6.5-12 is multiplied by the deposition rate (mg/m²-yr) and the 30-year RME residential exposure duration to obtain an average amount of air particulates deposited on offsite soil over the 30-year exposure duration. Thus, the use of the 0.5 averaging factor in Table 6.5-12 yields the average accumulation time of 15 years referred to in Section 6.5.11, p.6-25, and results in an estimate of the average contaminant concentration from time zero through year 30, assuming no loss of contaminants occurs

during this period through resuspension, runoff, or other disturbance.

It is not reasonable to assume that the receptor is exposed for the entire 30-year period to the concentration of contaminants present in soil after 30 years of deposition. Instead, the 0.5 averaging factor is used to estimate the average concentration of contaminants in soil during the 30-year period of deposition, then, the residential receptor is assumed to be exposed to that average concentration over the entire 30-year exposure period.

27. Section 6.6.3 Page 6-27 (Also tables in Attachment H3)

For exposure to noncarcinogens by ingestion of soil, when age-averaging is not performed and only an adult exposure is wanted, the correct exposure duration (ED) should be 30 years, not 24 years. It is appropriate to use the 24 year time period ONLY when age-averaging and including child exposures.

This methodology is conservative, and was reviewed for use by CDPHE before it was implemented in the exposure scenario technical memorandum. It is conservative to assess an adult and a child separately for non-carcinogenic effects. By assessing a child separately, chemical intakes are maximized due to the higher ingestion rate and lower body weight of the child. Since risks to non-carcinogenic chemicals are assessed by comparing chemical intakes to a threshold concentration, non-carcinogenic effects will be maximized by assessing child exposures separately from adult exposures.

The averaging time for adult exposure is 24 years multiplied by 365 days therefore the exposure duration is canceled out and does not affect the intake of noncarcinogens.

28. Section 6.6.4. Page 6-28

Soil matrix effect factors have not yet been agreed upon as acceptable for the Template. The "conservative" default factor (0.5) which was used for most chemicals is not necessarily conservative. For example, the ATSDR Toxicological Profile for PCBs (1992) reports 85-90% absorption of PCBs after oral ingestion, and ferrets that were administered PCBs in food absorbed >85%. Therefore, at least two references provide information that argues that a soil matrix effect factor of 0.5 may not be appropriate for at least one chemical.

Site-specific factors such as organic content of the soil, valence state or chemical form, etc. were not taken into account. For example, what is the average organic content of the soil at Rocky Flats AOC 1 or 2 or in the 10-acre exposure area of AOC 1? How would PCBs or other organic chemicals behave in soil of that particular organic content as opposed to soil containing more organic content? What effect would the site-specific soil organic content therefore have on the bioavailability of a particular class of organic or inorganic chemicals? What is the local pH and/or chloride or other salt content of the soil and how could these local conditions affect bioavailability?

The chemical form of Hg greatly influences the bioavailability. If site soil conditions favor the formation of mercuric sulfide, which strongly adsorbs to soil and therefore is absorbed by the body to a very small extent, a soil matrix effect factor could possibly be justified. However, a discussion of the form Hg takes in Rocky Flats samples is lacking.

Finally, if soil matrix effect factors are applied, appropriate site-specific information must be used in their derivation and the rationale for their use must be fully explained and justified. It does not appear, however, that much, if any, site-specific information was used in the derivation of the factors proposed in this document. Until DOE provides the results of site-specific animal bioavailability experiments or other site-specific information justifying the applicability of the proposed soil matrix effect factors to Rocky Flats conditions, these factors should not be approved.

Section H6.2.1, "Soil Ingestion," outlines the rationale for using specific Matrix Effect

values for soils. This rationale is conservative in that all matrix effect factors are high given the literature findings. Where a matrix effect could not be justified, a matrix effect of 1.0 was used. This conservative approach takes into account different soil types.

29. Section 6.7. Page 6-29

Were the oral toxicity values that were used to estimate effects from dermal absorption of organic chemicals adjusted to account for absorbed dose as per RAGS (Part A), p. A-2?

It is necessary to assess dermal exposure with respect to the overall risk in the risk assessment to judge whether an adjusted oral toxicity value is needed. Oral toxicity values were not adjusted to estimate effects from dermal absorption. As discussed in section H7.1 adjustment of oral toxicity factors is not considered necessary unless dermal exposure may contribute to unacceptable risk. Furthermore, EPA 1992c (Dermal Exposure Assessment) states that "until more appropriate dose response factors are available, it is recommended that assessors use the oral factors." Because risk from dermal exposure for the office worker in AOC1 were approximately 2×10^{-6} and risks for other receptors were comparably low, no further evaluation of dermal toxicity factors appears warranted. Even though the risks from dermal exposure may be somewhat underestimated by this approach. We will modify the Uncertainties Section to include this discussion.

30. Section 6.8.2. Page 6-31; Section 6.8.3 Page 6-32; Section 6.11.1. Page 6-48

These are the first of many sections which imply that 10^{-4} risk is the starting point in considering possible actions. A 10^{-6} risk remains the point of departure for remedial action.

The 10^{-6} risk level is considered the point of departure for remedial action. Also, all references to acceptable risks within this section, are referenced to EPA guidance.

31. Section 6.8.7. Page 6-37

It is still premature to make the conclusion that the groundwater will never be used or that people will never be exposed to it in some manner. The Division's policy as written in the referenced letter (CDPHE, 1995) does not support the statement, "Residential use of groundwater will not occur in OU-2 because future land use at RFETS will not include residential development." This statement implies that institutional controls will be imposed to prevent direct ingestion of groundwater. This statement also ignores the eventual application of groundwater standards.

The Future Site Use Working Group at Rocky Flats has recommended that the buffer zone be used for open space use and that the industrial area be maintained as industrial property. Residential land use is not deemed appropriate at the Rocky Flats Environmental Technology Site (RFETS).

32. Section 6.8.8. Page 6-38 (also Section 6.11.1. Page 6-48)

The discussion on why lead should be eliminated from consideration as a groundwater COC fails to mention that RAGS guidance (Part A, p. 6-27) is that risk from unfiltered samples of water should be assessed. This policy is in place because most private drinking water wells are not filtered. Thus, even though the filtered sample may meet State or Federal drinking water standards, anyone drinking an unfiltered sample of this water would face an increased risk of toxicity because of the high metals associated with the high suspended solids. The high total suspended solids may be an indication that samples from this well are unreliable for one reason or another, however, the potentially elevated risk of drinking the unfiltered groundwater should be stated.

RAGS guidance directs that unfiltered ground water samples are to be used to assess risks within the human health risk assessment. Filtered sample results and geochemical analyses are important when evaluating if a chemical is a contaminant. Lead was

evaluated by examining Total Suspended Solids (TSS) and the filtered sample results.

High TSS in unfiltered ground water samples is indicative of sample turbidity, often resulting from well development and sampling procedures. Since the high lead results were associated with high TSS, lead concentrations may be due to sample turbidity. There is also no dissolved lead present above background concentrations since the filtered sample results were not high in lead. The presence of dissolved lead would indicate transport of lead from a source. High TSS coupled with background levels of dissolved lead indicates that lead is not a site contaminant.

33. Section 6.10, Page 6-43

In addition to the uncertainties which may overestimate risk, there are also uncertainties in the measurement and sampling protocols which may either overestimate or underestimate risk.

Uncertainties in each phase of the risk assessment could overestimate or underestimate risks. These uncertainties are handled though by making reasonably conservative assumptions so that potential risks are not underestimated. The Uncertainties section will be modified to mention factors that could overestimate or underestimate risk.

34. Section 6.10.4, Page 6-45

The qualitative assessment of the toxicity of those chemicals for which no toxicity factors exist must be provided as agreed upon. Toxicity information on lead is included; information for copper and 1,1,1-TCA is lacking.

A qualitative assessment of copper and 1,1,1-TCA can be found in Section H10.1.4, "Toxicity Assessment," on page H10-8. Other chemicals without toxicity factors are also discussed in general on page H10-8. Detected chemicals without EPA toxicity factors and their detection frequency are listed in Table H3-1.

35. Section 6.11.1, Page 6-48

The rationalization for why RME cancer risk estimates over-estimate the actual risk is unjustified. The fact that two plutonium values in the 30-acre area contribute significantly to the overall risk does not mean they can be ignored. These sample sites should instead be noted for possible cleanup. Since the RFI/RI should only present the risks and the uncertainties surrounding them, this section should be re-worded.

The explanation for why the RME cancer risk estimate for the future industrial/office worker probably overestimates actual risk was not meant to imply that the two samples with high plutonium concentrations should be ignored. Instead, the explanation was intended to draw attention to the fact that the exposure concentration term for plutonium was "driven" by two high results and that the entire exposure area is not characterized by these high concentrations.

We will revise the text as follows: (1) We will delete the second-to-last paragraph on page 6-47 (which also refers to the RME cancer risk estimates as overestimating actual risk in AOC No. 1) because the risks estimates are well within EPA's target risk range and further discussion is not required. (2) We will clarify the text on pages 6-48 to 6-49 to state that the concentration term (and therefore risk) for the industrial/office worker in the 30-acre maximum exposure area is driven by the plutonium concentrations in two samples, but that other samples had significantly lower concentrations.

36. Table 6.3-3

The reference listed below this table (DOE, 1994k) which presents the results of the chromium specification study is NOT listed in the reference section. The Division needs to see a copy of this study before agreeing with the assumption that only Cr (III) is present.

A formal speciation study report was not developed. The reference will be deleted from the table. The results of speciation data are available and were outlined in the response to the CDPHE comment on Table 3-4 from Technical Memorandum No. 9, Chemicals of Concern. The comment response is partly repeated below.

Speciation data are available. Twelve surface soil samples in OU 2 were analyzed for total chromium and for Cr+6. Six analyses for Cr+6 were useable; the other six were R-qualified (rejected) because of exceedence of holding times. Cr+6 was nondetect in all samples. The SQL was approximately 1 mg/kg (CRDL was 2 or 10 mg/kg). Total chromium was detected in these samples in concentrations ranging from 9 to 16 mg/kg. Of the samples with useable Cr+6 results, one was collected in the northeast trenches area south of the B-series ponds, one was collected in IHSS 216.2 (East Spray Field) where chromium contaminated wastewater is thought to have been sprayed, and four were collected in non-IHSS areas in the buffer zone. These data indicate that Cr+6 does not occur in elevated concentrations in OU 2 surface soils, even where chromium-bearing wastewater may have been disposed.

37. Table 6.3-8

Guidance in RAGS on doing concentration/toxicity screens allows using only a single slope factor in the calculations. This is fine in most situations, where either the oral or the inhalation slope factor greatly outweighs the other. However, for chemicals like 1,2-dichloroethane, which have very similar or equal oral and inhalation slope factors, there is a significant risk that is not accounted for. It would seem prudent to add the combined risks from all the pathways in this screen if the chemical has similar toxicities from more than one pathway.

Application of the Concentration/Toxicity Screen was presented in Technical Memorandum #9 Chemicals of Concern. However, even if the suggestion were applied to 1,2-dichloroethane, this chemical would still not be a Chemical of Concern (COC).

38. Table 6.5-4

It is unclear why the deposition rate of chemicals of concern is labelled "Not Applicable" for the 30- and 50-acre areas of AOC 1.

Deposition rates are "Not Applicable" for the 30 and 50 acre areas in AOC 1 since the deposition on garden produce pathway is not assessed in these areas. This is the only pathway where deposition rates would be applied for estimating onsite exposure.

Deposition of chemicals of concern in AOC1, AOC2, and the 10-acre area in AOC1 was used to estimate chemical concentrations on exposed edible portions of homegrown produce for a hypothetical onsite residential scenario. The 30- and 50-acre exposure areas were delineated to assess potential exposure of future industrial workers, ecological researchers and open space users; ingestion of homegrown produce is not an applicable exposure pathway for these receptors, who are exposed to contaminants in surface soil by the ingestion, dermal contact, and inhalation pathways. Therefore, deposition rates were "not applicable" for risk assessment in these areas. The footnote for "NA" in Table 6.5-4 will be expanded to provide clarification.

39. Appendix G. Section G1. Page G1-1

The FDM and VVDM models can be considered useful for screening, however, use of ISCST2 should be considered. The VVDM does not have EPA validation.

At the time of the modeling a new version of FDM was released and was considered the most accurate model for dispersion of particulates from area sources. The use of VVDM would give more conservative results when the receptor is on top of the source. The air modeling procedure has been used for OU2 and other OUs and has been approved by

the Regulatory Agencies.

The FDM was specified as the dispersion model of choice because it incorporates key process and met a series of modeling criteria established for the OU2 Human Health Risk Assessment (see Technical Memorandum No. 6, Human Health Risk Assessment, OU2, Model Description, January 1993). Additionally, Wings (1990) outline several apparent problems associated with the area source algorithm in the Industrial Source Complex Model, lending further justification for the use of FDM. (Wings, K.D.[1990]. Letter to EPA Region X. TRC Environmental Consultants. Moutalake Terrace, WA).

The VVDM approach is similar to EPA's approach for deriving soil cleanup levels via the soil to air pathway (see USA EPA 1991, Human Health Evaluation Manual, Part B, Development of Risk-Based Preliminary Remediation Goals, OSWER 9285.7-01B).

40. Appendix G. Section G3. Page G3-1 Has the equation derived from MRI's wind tunnel study been justified and accepted?

The data and derived equations were presented to the Agencies on June 20, 1995 and were accepted.

41. Appendix G. Section G3. Page G3-2

Assuming a 50% particulate emissions reduction factor is valid, depending on the delivery method. With some methods, the percent control is less 50%.

It is assumed that the site would be controlled for fugitive dust emissions by watering the construction site. Watering is a common practice used during construction at RFETS, and therefore, a valid assumption. The 50% reduction factor as a result of an effective watering program was obtained from AP-42, Section 11.2.4.4 (EPA 1993).

42. Appendix H. Page H.ES-5

The exceedance (2×10^{-6}) of the acceptable cancer risk range for the RME future industrial/office worker receptor is downplayed in this section. See Comment No. 35 above.

We will revise the text on page H.ES-5 in accordance with our response to Comment 35.

43. Appendix H. Page H.ES-4 & 6

The conclusion that groundwater contaminants have not migrated offsite needs to be discussed in light of the recent increasing plutonium detects in samples from the 0486 boundary well.

Well 0486, was abandoned in 1993; the most recent analytical data are from 11-18-92. Well 41691, which replaced well 0486, was the subject of numerous discussions between the state, cities, and DOE in early 1994. These discussions centered around the activities of total (suspended plus dissolved fractions) plutonium-239/240 reported from groundwater samples collected from well 41691. These total activities ranged from 2.204 pCi/L (12-7-91) to 0.032 pCi/L (12-9-93), with a general downward trend (Figure 1). The amount of dissolved plutonium in these samples never exceeded the site-specific standard of 0.05 pCi/L.

Data for unfiltered samples of groundwater from well 41691 clearly show a strong correlation between total suspended solids (TSS) and radionuclides (Figures 2a and 2b). In addition, data from wells installed using aseptic drilling show low activities of plutonium in unfiltered samples. Moreover, it is unlikely that particulates, to which the plutonium is adsorbed, are actually moving through the hydrostratigraphic unit. Groundwater velocities are too low and the nominal pore sizes are most likely too small for the particulates to be transported in the subsurface. The evidence for wellbore contamination with plutonium-bearing surface soils is clear, and the issue of groundwater transport of plutonium is

considered resolved,

44. Appendix H, Section H1.2, Page H1-3

IHSSs 153 and 154 "were located within the Protected Area of RFETS and could not be sampled". How and when will these IHSS's be sampled and evaluated?

For the purpose of preparing the OU2 Phase II RFI/RI Report, samples taken near IHSSs 153 and 154 were used in the risk calculations and in the determination of the nature and extent of the contamination. However, prior to performing any remediation or closure of these IHSSs, further characterization will be performed. The results of the characterization will be made available to the Regulatory Agencies and will be used as support for Proposed Action Memorandums (PAMs) or Record of Decision (ROD) documents.

45. Appendix H, Section H1.3, Page H1-4; Section H2.1.1, Page H2-3

The most recent groundwater samples collected from the IHSS and used for the risk assessment were from the fourth quarter of 1992. This data is dated, and may no longer accurately delineate the extent of contamination. Any more recent data, particularly any that reflects this past spring's very wet conditions, should be compiled and compared with the older data, even if only to corroborate the existing data. See General Comment No. 1 above.

Although the data set used in the OU2 Phase II RFI/RI Report ends in the fourth quarter of 1992, groundwater data is continuously monitored, collected, and reported annually in the Groundwater Monitoring Report.

46. Appendix H, Section H3

The Division previously commented on including tritium in its review of Technical Memorandum (TM) No. 9 - COCs. Tritium should not have been eliminated as a COC. Figure 4-4f in TM 9 shows a tritium hit of $3.56 \text{ E}+4 \text{ pCi/g}$ in the subsurface soil northeast of the 903 Pad. In addition, other, much lower concentrations of tritium were detected in subsurface soil in other locations around OU-2 (Figs. 4-4f to 4-4i). The justification for eliminating tritium as a COC has not been discussed either in TM 9 or in this RFI/RI document.

The results of a tritium analysis were outlined in the response to the CDPHE comment on Table 4-5 from Technical Memorandum No. 9, Chemicals of Concern. The comment response is partly repeated below.

Tritium is not a chemical of concern in subsurface soil. The maximum reported tritium activity in subsurface soil was $36,500 \text{ pCi/L}$ (mean activity = 243 pCi/L and standard deviation = 2267 pCi/L). The maximum activity in units of pCi/L can be converted to units of pCi/g soil using the average soil moisture content of 13.5%. $36,500 \text{ pCi/L}$ translates into 4.9 pCi/g soil. If this concentration were used in the concentration/toxicity screen, tritium would fall out as a chemical of concern.

47. Appendix H, Section H3

In its review of TM9, the Division commented on the detections of 1,1,2,2-PCA and cis-1,3-dichloropropene in groundwater. The Division's comment asked whether information more recent than November, 1992, (which had some of the highest detects) was available to confirm the high hits. The Division also questioned the elevated reporting limits for these chemicals, particularly for 1,1,2,2-PCA, and asked whether or not the detects could be related to storm events. The elimination of these two chemicals as COCs has not been justified and they should be included in the RFI/RI evaluation.

DOE has re-evaluated the analytical results for these compounds in groundwater and in subsurface soil at the locations of maximum groundwater concentrations and has come to the following conclusions:

(1) In subsurface soil, the maximum concentrations of cis-1,3-dichloropropene and 1,1,2,2-PCA were 6 ppb (at BH2887 in the 903 Lip area) and 5 ppb (at boring 08291 in the Southeast Trenches area), respectively. Overall detection frequency in soil was < 1% for each compound. The maximums were detected in groundwater (1600 ppb cis-1,3-dichloropropene and 180 ppb 1,1,2,2-PCA) were both found at Well 7391 near Trench T-2 in the 903 Pad area. These compounds were not detected in subsurface soil samples collected in numerous borings at Trench T-2, including boring 7391, which was completed as a monitoring well. These results do not indicate that subsurface soil is a significant source of these contaminants.

(2) It is true that elevated reporting limits can make the calculation of detection frequency and assessment of temporal transience uncertain; however, review of the data indicates that these compounds are not likely to be present in most samples where they were reported non-detect. Using the data shown on Table B-4 in TM9 as a basis for evaluation, reporting limits in samples collected from wells where the compounds were detected at least once ranged from 0.01 ppb to 1500 ppb; however, 80 percent of the samples (19/24) had reporting limits of 0.01 to 0.5 ppb, and only 3 of the 24 samples (12 percent) had reporting limits above 10 ppb. Most detected concentrations ranged from 0.3 to 2 ppb, and reporting limits from 0.01 to 0.5 ppb are low enough to detect the lowest reported concentrations of these compounds. Nevertheless, there are a few samples with extremely elevated reporting limits where only a qualitative assessment of the probable presence or absence of the compounds can be made, based on sampling history (see(4) below).

3) In Table B-4 of TM9, all reporting limits for samples analyzed for cis-1,3-dichloropropene and 1,1,2,2-PCA, except one reporting limit of 1500 ppb for 1,1,2,2-PCA, are below the screening criteria of 1000 X RBCs for residential use of groundwater (127 ppb for cis-1,3-dichloropropene and 90 ppb for 1,1,2,2-PCA; DOE 1994a). Therefore, even if the compounds were present in concentration equivalent to reporting limits, with one exception, the concentrations would not exceed the 1000 X RBC screening level.

4) The rationale for eliminating the compounds from further evaluation is based on temporal transience of the elevated concentrations. The low reporting limits for most samples in which the compounds were non-detect support a conclusion that high concentrations of these compounds are isolated occurrences. The temporal variability of detections of 1,1,2,2-PCA in well 7391, where the maximum concentration of 180 ppb was detected, was further evaluated by reviewing results of subsequent sampling rounds at this well. 1,1,2,2-PCA was non-detect in all six subsequent samples for which results are available. Reporting limits for the six samples were variable: 400, 1500, 5, 10, 2500, and 2500 ppb. Elevated reporting limits occur because of sample dilution to detect even higher concentrations of other VOCs present in the sample. While the elevated reporting limits introduce uncertainty, we believe sufficient evidence is present to conclude that high concentrations of 1,1,2,2-PCA (i.e., concentrations above 1000 X RBCs) are temporally isolate occurrences.

(5) The elimination of these two compounds from further evaluation in risk assessment will not alter the results or conclusions of the risk assessment or remediation decisions for OU 2. Groundwater in OU 2 is contaminated with chlorinated solvents detected in up to 68 percent of samples, in concentrations up to 150,000 ppb (trichloroethene). Some of the highest concentrations occur at the 903 Pad area, where the cis-1,2-dichloropropene and 1,1,2,2-PCA were detected. Remediation of the chief chlorinated solvents in groundwater will result in clean up of other chlorinated solvents as well.

In conclusion, we believe the exclusion of cis-1,3-dichloropropene or 1,1,2,2-PCA as special case COCs in groundwater is justified, because the evidence indicates they are detected at low frequency, high concentrations appear to be temporally isolated, and

overall risk estimates and remediation decisions will not be affected.

48. Appendix H, Section H3.1.5, Page H3-3

Qualitative toxicity assessments of PAHs in surface soil and of arsenic, antimony, beryllium and manganese in groundwater are supposed to be evaluated in the uncertainty section of the Human Health Risk Assessment. Please reference the location in this text.

These chemicals are assessed in Section H10.2, "Evaluation of Risk Associated With Special Case COCs." A reference to this assessment will be added to section H3.1.5, "Professional Judgement."

49. Appendix H, Section H3.1.7 Page H3-4 The qualitative toxicity assessment of the chemicals without EPA toxicity factors is missing.

A qualitative toxicity assessment of chemicals without EPA toxicity factors can be found in section H10.1.4, "Toxicity Assessment." The text of section H3.1.7 will be modified to include a reference to section H10.1.4.

50. Appendix H, Section H3.2.1, Page H3-5

The decision not to include the PAHs in the concentration/toxicity screens needs to be supported by evidence that the PAHs could not have come from various routine burning activities at Rocky Flats or from the accidental releases from the several fires.

In CDPHE comments to Technical Memorandum No. 9, "Chemicals of Concern," CDPHE states that "evaluating the risk from exposure to soil containing PAHs in the uncertainty section is probably sufficient." Due to this, PAHs were not added to the concentration/toxicity screen and were evaluated in section H10.0, "Uncertainties and Limitations."

51. Appendix H, Section H3.2.1, Page H3-5

It would be helpful to include a reference to a map which shows the location of the chromium hot spots. Were these hot spots associated with any historical waste disposal sites?

One chromium result (26 mg/kg, BSL=24.8mg/kg) was associated with sampling site SS200193, located on the western edge of IHSS 1450 (Reactive Metal Destruction Site) and the other result (29.5 mg/kg) was associated with sampling site SS200893, located on the southern edge of the Southeast Trenches Source Area (not associated with any IHSS). These results are shown on Plate 4.2.3. A reference to this plate will be added to the text.

52. Appendix H, Section H3.2.1, Page H3-5

Missing from the discussion of bis(2-ethylhexyl)phthalate (BEHP) is the acknowledgement that BEHP was used at Rocky Flats. It is currently still being used to test HEPA air filter efficiencies.

Diocetylphthalate is used to test the efficiencies of HEPA filters at Rocky Flats, and all testing is conducted within buildings or labs. Break-through contamination during testing would account for a very negligible amount of diocetylphthalate in the environment. HEPA filter testing is an unlikely source of BEHP in surface soils in OU 2.

53. Appendix H, Section H4.3, Page H4-6

The discussion in the Hypothetical Onsite Residents section states that, "because residential development is not a reasonable future land use in OU-2, cleanup levels will not be based on estimates of risk to this hypothetical receptor." Given that future site use has yet to be determined, this statement is premature. An RFI/RI report should simply state the risks and leave discussions of cleanup levels to the CMS/FS process.

The Future Site Use Working Group at Rocky Flats has recommended that the buffer zone be used for open space use and that the industrial area be maintained as industrial property. Residential land use is not deemed appropriate at the Rocky Flats Environmental Technology Site (RFETS). Institutional controls will be initiated as appropriate. The text in section H4.3 will be modified to remove reference to cleanup levels.

54. Appendix H, Section H4.4.1, Page H4-8

The discussion in the section regarding why ingestion of livestock is a negligible pathway has been improved from previous documents. However, a reference for the source of this information (that small herds are grazed only temporarily near RFETS and that cattle receive large amounts of supplemental feed) is still lacking.

Due to recent field tours of off-site areas, the beef ingestion pathway will be assessed in the residential scenario of the OU 3 human health risk assessment. The text will be changed to reflect this.

55. Appendix H, Section H4.4.3, Page H4-11

The discussion of why external irradiation exposures to offsite residents resulting from deposition of radionuclides in airborne particulate matter should be considered negligible does not take cumulative deposition into account. The air model is based on annual averages, and should not (without summing annual deposition over the years) be used to justify eliminating this exposure pathway. The strongest evidence that external irradiation is probably a negligible contributor to risk (as discussed in previous sentences) is the fact that offsite soil concentrations are below protective risk-based levels. The text should also make it clear that this is a complete pathway, but that it is negligible. This has not been adequately done in this rationale since DOE has grouped negligible complete and incomplete pathways together.

It is understood that the off-site transport of and exposure to radionuclides is a public concern. This is why the most significant contributors to risk were included in the assessment of the off-site receptor. The pathways of soil ingestion, soil inhalation, dermal contact with surface soil and ingestion of fruits/vegetables were assessed for the off-site residential receptor.

To understand the contribution of external irradiation to the off-site receptor, a comparison between soil ingestion and external irradiation can be made for the hypothetical on-site resident for Area of Concern No. 1 in Attachment H3, "Health Risk Calculations." The carcinogenic risk from direct soil ingestion using the Reasonable Maximum Exposure (RME) parameters is $2.45\text{E-}04$ for Pu-239/240 and Am-241 combined. The carcinogenic risk from external irradiation using the same RME parameters is $3.68\text{E-}06$ for Pu-239/240 and Am-241 combined. This shows that the external irradiation pathway is about 67 times smaller than the soil ingestion pathway. Quantification of the external irradiation pathway is therefore not considered warranted. The most significant contributors to risk are being assessed.

Any remediation required will assess the ingestion and inhalation pathways for a receptor. If risks from these pathways are found to be acceptable, then it can be surmised that risks from the external irradiation pathway will also be acceptable.

56. Appendix H, Section H4.4.3, Page H4-11

The discussion of ingestion of groundwater as an incomplete pathway for offsite residents may need to be reconsidered. While UHSU groundwater may not discharge offsite as groundwater, it does reach offsite as surface water, which may eventually percolate into another groundwater regime. Rather than label this as an incomplete pathway, it may be more appropriate to label it as a potentially complete, though negligible pathway.

The text will be modified to describe the pathway as potentially complete but negligible as requested. No further evaluation of this pathway will be performed.

57. Appendix H. Section H4.4.3. Page H4-11; Section H5.7. Page H5-9

An inappropriate argument is used to justify why exposure of current offsite residents to surface water/sediment in Walnut and Woman Creeks should be incomplete. The justification is that, "under the RFETS surface water management plan, surface water is monitored and discharged at concentrations that meet applicable federal and state surface water requirements. Therefore, the creeks do not provide a means of current offsite exposure to contaminants potentially released from OU-2". This argument is inaccurate. Simply because the streams are monitored, does not mean that the standards are met. Site-wide plutonium standards were exceeded in Pond C2 and in Woman Creek offsite during this spring's high water flows. While these standards are ambient, rather than health-based, and risks to human health were low, the pathway is still complete. These paragraphs should be reworded to show that the pathway is complete, though negligible.

The word "incomplete" will be changed to "complete, but negligible" as requested.

58. Appendix H. Section H4.4.5. Page H4-13

By not including surface water/sediment as an exposure pathway for construction workers, this report underestimates potential risks to this receptor. Exposure to anyone constructing bridges, drainage ponds, putting in culverts, etc. is not taken into account.

The future construction worker exposure scenario was developed for the express purpose of assessing subsurface soils since no other exposure scenarios assess this environmental media. Other exposure scenarios (i.e., future on-site resident, future off-site resident, future on-site ecological researcher, future on-site open space user and off-site resident) directly assess risks from surface water and sediments. This array of exposure scenarios adequately assesses the risks from exposure to surface water and sediment.

59. Appendix H. Section H4.4.8. Page H4-15

Exposure to subsurface soil, which according to local construction practices is commonly spread over a whole residential building site, should not be regarded as an incomplete or negligible pathway for future residents. This pathway should be part of the residential evaluation.

See response to Comment No. 58.

60. Appendix H. Section H5.2. Page H5-3

The statement that the sum of the maximum detected concentrations of PCB "is well below the cleanup guideline of 25 mg/kg for industrial use commonly applied to PCB spills" assumes that industrial use will be institutionally controlled around the Mound Area.

The sentence will be deleted from the text.

61. Appendix H. Section H5.7.2. Page H5-11

The statement, "because the source of VOC loading is groundwater seeps, modeled concentrations of VOCs in surface water are inversely proportional to streamflow (i.e., maximum VOC concentrations in the creeks are predicted for years of low average streamflow)" seems inaccurate. This statement assumes a constant seep flow. Isn't it likely that the same low precipitation that causes low streamflow would also decrease seep flow? Would this assumption have an effect on other modeling assumptions?

The groundwater flow model used to provide the estimates of seep flow was a steady state model, therefore seep flows were constant. Although a transient groundwater flow model would provide more realistic estimates of seep flow, the assumption of steady state seep flow is conservative and appropriate based on the goals of the Human Health Risk Assessment.

62. Appendix H, Section H5.7.2, Page H5-12

What is the rationale for using the maximum percentile 30-year average concentration for VOCs and the 90th percentile 30-year average concentration for radionuclides. Why are these two chemical classes being treated differently?

Upper bound concentrations of VOCs and radionuclides in surface water were used in order to assure that risks are not underestimated. If maximum concentrations were used for radionuclides, total risks for all exposure scenarios would not change.

63. Appendix H, Section H5.8.1, Page H5-14

VOC uptake by leaves probably makes a bigger contribution than from the roots (Riederer, M., Env. Sci. Tech. 1990, 24:829-837; Travis, et al., Chemosphere. 1988, 17:277-283; Nash & Beale, Science, 1970, 168: 1109-1111; Buckley, Science. 1982, 216:520-522; Bacci & Gaggi, Bull. Env. Contam. Tox. 1985: 35:673-681; Gaggi et al., Chemosphere. 1985, 14:1673-1686; Bacci et al., Env. Sci. Tech. 1990, 24:885-889). However, this report does not assess root uptake and therefore the modeled values are probably an underestimate. A discussion of this underestimation should be included in the uncertainty section.

Root uptake of organics was assessed in the human health risk assessment. Section H5.8.1 outlines the methodology used to assess this root uptake. Uptake by leaves was not evaluated, but text will be modified to include this discussed in the uncertainties section as requested.

64. Appendix H, Section H10.2.4, Page H10-14

A brief qualitative discussion of the toxicity of PAHs needs to be included in this part of the uncertainty section.

A qualitative discussion of the toxicity of PAHs will be added to Section H10.2.4, "PAHs in Surface Soil."

65. Appendix H, Table H5-5

A footnote to this table to explain why the deposition rate is listed as >0 would make the table much clearer. The text on page H5-6, which states, "the model reports 'zero' impacts when modeled PM₁₀ concentrations are less than 0.001 µg/m³" would suffice as a footnote.

A footnote will be added for air concentrations shown as zero in Table H5-5. The footnote will state that, "the model reports '0' when modeled PM₁₀ concentrations are less than 0.001 µg/m³."

66. Appendix H, Table H5-7

DOE should state somewhere on this table, perhaps as a footnote, which 5 years were used to determine the 5-year maximum annual average air concentrations.

A footnote will be added to Table H5-7 that states that the five years of air data from 1989 through 1993 were evaluated for this table.

67. Appendix H, Table H5-13 (Also all impacted calculations shown in Attachment H3, i.e., ingestion of fruits/vegetables with soil deposition)

Vegetable intake was calculated incorrectly. By multiplying the 50th Percentile Homegrown Intake by the % Individuals Consuming, the report essentially calculates a population average. In this document all other calculations are based on an RME or CT individual's exposure, as they should have been. The 50th percentile values should be taken directly from Table 2-10 in EFH to obtain an RME or CT individual's average intake. The risk should then be calculated based on those average intake numbers. Because population intake and risk values were used, the total homegrown vegetable and fruit intakes listed in Table H5-13 significantly underestimate the

average individual intake, and thus will estimate the average risk.

As an example, this report estimates an average homegrown intake of 37 and 4.8 g/day for vegetables and fruits, respectively. Compared to this, and based on the data shown in Table 2-10, EPA recommends that the average daily consumption of homegrown generic vegetables is calculated by determining 25% of 201 g/day, which is equal to 50 g/day. The recommended average homegrown percentage of generic fruits is 20% of 142 g/day, or 28 g/day. RME values would be 40% of 201 g/day, or 80 g/day vegetables, and 30% of 142 g/day, or 42 g/day fruit. Thus, both the average and the RME individual intake of fruits and vegetables are significantly underestimated, and therefore risk from this pathway will be underestimated.

In addition, the fraction homegrown has been factored into the fruit and vegetable intake calculations twice. The fraction homegrown has already been included in the calculation to obtain the 50th Percentile Homegrown numbers listed in Table 2-10. If the 50th Percentile Homegrown numbers from Table 2-10 are used, the Fraction Homegrown factor should not then be included in the intake calculations too, since that is duplicative. The Fraction Homegrown factor is appropriate to use only if the total amount of vegetables or fruit consumed is employed, as when one is using the recommended default values of 201 g/day vegetables and 142 g/day fruit (Exposure Factors Handbook, 1989, p. 2-24; OSWER Directive 9285.6-03, Human Health Evaluation Manual, Supplemental Guidance: "Standard Default Exposure Factors:", 1991 p.7; Superfund's Standard Default Exposure Factors for the Central Tendency and Reasonable Maximum Exposure, 1993, p.15). This factor should not be employed when utilizing the specific values for homegrown fruits and vegetables listed in Table 2-10.

Finally, where do the numbers for "Exposed vegetable or fruit intake (g/day)" come from? What is the justification for using them?

Vegetable intake was calculated using the equation shown in Section H6.2.7 and the values shown in Table 6 of Attachment H2, which are EPA default values, as recommended by the reviewer. EPA RME default values for total intake of 140 mg/day (fruits) and 200 mg/day (vegetables) were used with EPA-recommended fraction of homegrown values of 0.20 (CT, fruit), 0.30 (RME, Fruit), 0.25 (CT, vegetables), and 0.40 (RME, vegetables) to yield homegrown intakes of 28 g/day (CT, fruit), 42 g/day (RME, fruit), 50 g/day (CT, vegetables) and 80 g/day (RME, vegetables). The fraction homegrown values were factored into the fruit and vegetable intake calculations only once.

The 50th percentile homegrown numbers and other estimates of homegrown produce ingestion shown on Table H5-13 were not used as estimates of total ingested homegrown produce in the risk calculations. Instead, the homegrown vegetable intakes estimated in Table H5-13 were only used to estimate the fraction of ingested homegrown produce that has an exposed edible surface and, therefore, the fraction that should be evaluated for ingestion of deposited surface contaminants (see response to #71 for further details).

68. Appendix H Attachment H2~ Table 10-A

This table lists a CT ingestion rate for a child of 15 mg/visit and for an adult of 8 mg/visit. Neither the Division nor EPA have approved these two values, and comments on this were sent to DOE as part of the Template negotiations. Furthermore, as part of Steve Slaten's letter to Martin Hestmark and Joe Schieffelin, dated 6-15-95, DOE specifically stated that, "the Central Tendency (CT) values for soil ingestion for adults and children have been changed to the more conservative values of 25 mg/day and 50 mg/day, respectively". The latest agreed-upon exposure factors should be used.

The CT soil ingestion rates were adjusted to take into account the number of hours an open space receptor spends recreating per day. This was performed in order to be consistent with the inhalation exposure route. This is discussed further in the footnote 1 to Table 10-A.

69. Appendix H. Attachment H2. Table 10-F The CT Gamma Exposure Time Factor should be 0.1, not 01.

The number in the table will be changed. The risk calculations used the correct value of 0.1.

70. Appendix H. Attachment H3. Current Onsite Worker - AOCI Tables

What is the source of and justification for using the weighting factor? This factor was never discussed in the Template negotiations, and neither agency has agreed to its use.

The weighting factor was incorporated into the current on-site industrial worker exposure scenario (Security Inspector) to account for the fact that current workers are not constantly present in the OU 2 area. Since a security inspector tours the whole site, an area weighting factor was applied to this exposure scenario to take into account the fraction of time spent in OU 2 by the security inspector. An equivalent procedure would have been to decrease the annual exposure frequency of the security inspector. The risk assessment will not change from one procedure to the other. Since the exposure factors in Attachment H2, "Exposure Factor Tables," are to be used across all OUs, it is more efficient to keep the exposure frequency of 250 days/year for the security inspector and apply the weighting factor by OU. In order to apply exposure factors efficiently across the whole site, the weighting factor will be used in the risk assessment.

71. Appendix H. Attachment H3, Hypothetical Onsite Resident - AOCI, Ingestion of fruit with soil deposition

What is the source of and justification for this 0.7 fraction exposed? This factor does not agree with the fraction shown in Table H5-13.

The discrepancy between the 0.8 reported in Table H5-13 for fraction of ingested fruits with an exposed surface and 0.7 used in risk calculation in Appendix H3 is due to differences in rounding. When the total daily intake of fruit, taken to 3 significant digits, is divided by the intake of vegetables with edible surfaces, also taken to 3 significant digits, the result is slightly less than 0.75; rounded = 0.7. When the values are rounded to 2 significant digits (as shown in Table H5-13), total intake divided by intake of vegetables with edible surfaces (3.6/4.8) is exactly 0.75; rounded = 0.8

Some fruits and vegetables have exposed, edible surfaces (apples, lettuce), whereas others have surfaces that are inedible and are removed prior to ingestion (cantaloupe, peas). When evaluating exposure to contaminated particulates on surfaces of ingested fruits and vegetables, it is reasonable to conclude that no exposure occurs from ingestion of fruits and vegetables when the surface (and therefore the deposited particulates) are removed prior to ingestion. Table H5-13 estimates the fraction of total daily intake of fruits or vegetables accounted for by the ingestion of fruits or vegetables with edible surfaces: 0.7 and 0.3 for fruits and vegetables, respectively. When calculating exposure by the pathway, the use of the "fraction exposed" parameter limits exposure to that from ingesting fruits and vegetables with edible surfaces and does not overestimate exposure by including surface deposition onto fruits and vegetables without edible surfaces.

72. Appendix H Attachment H3. Hypothetical Onsite Resident - AOCI. CT-Ingestion of leafy produce with root uptake

What is the source and justification for the use of the Fraction of Total Produce? There has been no previous discussion or approval by the agencies regarding this factor.

The EPA RME default value for ingestion of produce is 340 g/day (200 g/day vegetables and 140 g/day fruit) (EPA 1989b). However, transfer coefficients for estimating concentrations of inorganic chemicals in garden produce resulting from uptake of chemicals

in soil were (1) B_f for food items that re reproductive or storage portion of the plants (most fruits and nonleafy vegetables) and (2) B_v for leafy vegetables (e.g., lettuce, spinach) (Baes et al. 1984). In the assessment of exposure via root uptake of chemicals in soil, intake of produce was divided into intake of (1) nonleafy fruits and vegetables and (2) leafy vegetables. Baes et al. (1984) reported that the estimated fraction of produce that consists of leafy vegetables is 0.058 (rounded to 0.06). Therefore B_v was used to estimate inorganic contaminant concentrations in 6 percent of homegrown produce and B_f was used to estimate inorganic contaminant concentrations in 94 percent of homegrown produce. Note: the total amount of daily ingested produce (340 g/day) was not changed in this assessment, instead the "fraction of total produce" parameters serve to weigh the fraction of ingested produce that is nonleafy fruits and vegetables (320 g/day) and that is leafy vegetables (20 g/day).

We will add footnotes to the produce ingestion risk calculations to explain the fraction exposed and fraction of total produce in the final report.

73. Appendix H. Attachment H3. Hypothetical Onsite Resident. 10-Acre Maximum Exposure Area in AOCL CT and RME Dermal contact with surface water

The Skin surface area and the conversion factor columns should not be listed as "zeros", nor should the final risk.

There is no surface water in the 10 acre maximum exposure area, therefore contact with surface water was not evaluated. These spreadsheets will be removed from section H3.

74. Appendix J. Section J7.1. Page J-25

This section on PARCC definition is well done, however, there is no discussion of whether statistical performance parameters used for assessing precision (besides relative percent difference) were met or not. EPA guidance states that, "minimum recommended levels for performance parameters in risk assessment in the absence of site-specific DQOs are 80% confidence levels, 90% power, and 10-20% minimum detectable relative differences" (EPA, Guidance for Data Useability in Risk Assessment (Part A), Final, 1992, p. 111). No discussion is included concerning whether this level of confidence or this level of power had been attained, though there is a fairly extensive discussion of the relative percent differences (in this section, as well as tables in Appendix J1). The relative percent differences assess the extent of measurement error. The power and confidence level information must be calculated and included in the RI/RFS in order to judge the amount of certainty as well as the amount of variability in the sampling.

We will include an assessment of data precision in the final report. Following EPA's guidance, the following steps will be performed:

- *Transform data*
- *Calculate coefficient of variance (CV) based on transformed data*
- *Calculate the number of samples required given the CV and statistical performance objectives (80% confidence level, 90% power, and 20% minimum detectable relative differences) following equations provided in Appendix IV, Guidance for Data Useability in Risk Assessment (Part A) (EPA, 1990)*
- *Compare the number of records used to the number of samples required*
- *If the number of records used is smaller than the number of samples required, evaluate the uncertainty on risk assessment*

75. Appendix J. Section J7.2.1. Page J-27

This section states that, "the seep sediment locations that were used to characterize OU-2 (SED031 and SED038) did not have field duplicate data available. The seep sediment field duplicate data that are tabulated in Appendix J1 represent samples that were not used in this

RFI/RI." a) Why were only two seep sediment sites used to characterize OU-2? b) Why are data that were not used in this RFI/RI included here? Why were the data not used?

Seep surface water and sediments are collected on a quarterly basis under the site-wide RFETS Surface Water Monitoring Program. Sampling sites SED031 and SED038 are the only seep sediment sampling sites located in OU2. The QA/QC samples associated with this program are collected on a program basis and not on an OU-specific basis. There are no QA/QC sediment samples (and therefore, no field duplicate data) associated with samples collected at the SED031 or SED038 sites. As part of the PARCC assessment, field duplicate data are used to calculate the relative percent difference, which is used in the evaluation of precision. Because no field duplicate data are available for seep sediment samples collected within OU2, all available seep sediment duplicate data collected at locations outside of OU2 were used in order to evaluate the precision of the site-wide seep sediment data set as a whole. The duplicate data used in the precision assessment are presented in Appendix J1. The text will be changed to eliminate confusion.

DRAFT

DRAFT

DRAFT

Mr. Martin Hestmark
U. S. Environmental Protection Agency, Region VIII
ATTN: Rocky Flats Project Manager, 8HWM-RI
999 18th Street, Suite 500, 8WM-C
Denver, Colorado 80202-2405

Mr. Joe Schieffelin, Unit Leader
Hazardous Waste Control Program
Colorado Department of Public Health and Environment
4300 Cherry Creek Drive South
Denver, Colorado 80222-1530

Gentlemen:

Enclosed are the complete Environmental Protection Agency (EPA) and the Colorado Department of Public Health and Environment (CDPHE) comments on the OU 2 Draft Final Phase II RCRA (Resource Conservation and Recovery Act) Facility Investigation/Remedial Investigation (RFI/RI) Report and the proposed responses to these comments. The Draft Final OU 2 Phase II RFI/RI report was delivered on May 23, 1995. As almost all of the report had been previously reviewed by the Agencies, minimal comments were expected. However, 24 pages of comments were received from the EPA on August 3, 1995 and the 75 comments were received from CDPHE on August 24, 1995, about one month behind schedule. We have requested a one month extension of the Interagency Agreement milestone from September 21, 1995 to October 23, 1995, in order to incorporate these late comments and comment responses into the final document.

There were substantially more comments received than anticipated. As we have previously discussed, these comments are minimally addressed as necessary. Errors will be corrected and confusing passages will be clarified. However, where the comment would require substantial effort to fully address and incorporate, yet yield little if any changes in the report's conclusions, the comment response reflects that the RFI/RI report will not be changed.

Numerous comments were received from both the EPA and CDPHE on the risk assessment, modeling and data set used in the report. The OU 2 risk assessment was generated after detailing the work to be completed in four, required, risk assessment technical memoranda and one letter report. These technical memoranda detailed the data and the methodology to be used for the chemical of concern (COC) identification, modeling, exposure scenarios, toxicity assessment and the CDPHE screen letter report. These were all reviewed and approved by the Agencies prior to completion of the activity. The data set was proposed in the COC technical memo and approved by EPA and CDPHE.

The groundwater and surface water models proposed in the modeling TM were approved by EPA and CDPHE. Numerous presentations were made during the modeling process to keep everyone informed of the numerous small changes that are always necessary. The modeling efforts were designed to generate the most conservative risk numbers. Using these very simplistic and very conservative models, no elevated risk from OU 2 was shown. The more realistic models requested are less conservative and will yield even less risk. Therefore, this approach is not recommended. The data set used in the report was previously approved in the COC process. While this data set ends two years ago, this large amount of data is still representative of OU 2 conditions. More recent groundwater and surface water data are presented in the annual groundwater and surface water monitoring reports. Recent trench data were not collected for and do not meet the data quality objectives for the RFI/RI reports. These

data will be presented in a separate report. The recent storm event data were not collected for the RFI/RI report and also do not meet the data quality objectives for the report. The RFI/RI reports are designed to demonstrate normal to somewhat conservative conditions. The recent storm event clearly did not fall into this category. These results will also be presented separately.

Many of the risk assessment comments dealt with the process of how the risk assessment was put together, without regard to whether or not the comment would impact the results of the risk assessment. Many of these comments had been previously addressed in meetings or in the technical memorandum comment responses. Each comment has been dispositioned as appropriate in the comment response. However, comments that would not change the results of the risk assessment were not incorporated into the risk assessment.

The comment that the bedrock was sufficiently characterized represents a major accomplishment. A Notice of Violation was issued for the Draft Phase II RFI/RI Report because the bedrock had not been characterized. After an expedited, abbreviated field program was conducted, which relied heavily on the observational approach, the conclusion was reached that there is no pathway through the bedrock. This comment implies that this conclusion has been accepted.

If you have any questions or require further information, please call _____ at _____.